

Amendment and Response

Applicant: Wolfgang Hetzel et al.

Serial No.: 10/577,173

Filed: October 27, 2009

Docket No.: I441.141.101/QIM4346

Title: SEMICONDUCTOR DEVICE WITH PLASTIC PACKAGE MOLDING COMPOUND,
SEMICONDUCTOR CHIP AND LEADFRAME AND METHOD FOR PRODUCING SAME

IN THE CLAIMS

Please cancel claims 17, 18, 20, 21, 26, 28, 29, 34 and 35.

Please add claims 36-40.

Please amend claims 16, 19, 22-25, 27, 30 and 31 as follows:

1-15. (Cancelled)

16. (Currently Amended) A semiconductor device comprising:

a plastic package molding compound;

a semiconductor chip;

a leadframe, the semiconductor chip being embedded in the plastic package molding compound, an upper side of the semiconductor chip and the plastic package molding compound are arranged on the leadframe; and

~~a~~an elastic adhesive layer being arranged between the plastic package molding compound and the leadframe, and between the semiconductor chip and the leadframe, configured for mechanical decoupling of an upper region from a lower region of the semiconductor device;

wherein peripheral regions of the semiconductor device are free of the elastic adhesive layer and include a metal layer completely covering the leadframe in the peripheral regions of the semiconductor device and mechanically decoupling the plastic package molding compound from the leadframe.

17-18. (Canceled)

19. (Currently Amended) A semiconductor device comprising:

a plastic package molding compound;

a semiconductor chip;

a leadframe, the semiconductor chip being embedded with one of its two upper sides and

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its peripheral sides in the plastic package molding compound, and the other of its two upper sides being surface-mounted on an upper side of the leadframe, and the region of the upper side of the leadframe that is not covered by the semiconductor chip being covered by the plastic package molding compound; and

a continuous elastic adhesive layer arranged between the plastic package molding compound and the leadframe, and between the semiconductor chip and the leadframe, on the upper side of the leadframe;

wherein peripheral regions of the semiconductor device are free of the elastic adhesive layer and include a stack of metal layers completely covering the leadframe in the peripheral regions of the semiconductor device and mechanically decoupling the plastic package molding compound from the leadframe.

20-21. (Canceled)

22. (Currently Amended) The semiconductor device as claimed in ~~claim 21~~claim 19, comprising wherein the stack of elastic metal layers ~~comprise~~ comprises a copper layer of a copper alloy arranged on the leadframe and a gold layer of a gold alloy applied on top of it.

23. (Currently Amended) The semiconductor device as claimed in ~~claim 21~~claim 19, ~~characterized in that~~ wherein the metal layers comprise a copper layer of a copper alloy arranged on the leadframe and ~~a gold~~ an aluminium layer of ~~a gold~~ an aluminium alloy applied on top of it.

24. (Currently Amended) The semiconductor device as claimed in ~~claim 21~~claim 19, comprising wherein the stack of elastic metal layers comprise a copper layer of a copper alloy arranged on the leadframe and a silver layer of a silver alloy applied on top of it.

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25. (Currently Amended) The semiconductor device as claimed in ~~one of claim 24~~ claim 19, comprising wherein the width of the stack of elastic metal layers in the peripheral regions of the semiconductor device are adapted to the width of sawing tracks in such a way that the elastic adhesive layer is not exposed to the sawing process in the production of peripheral sides of the semiconductor device.

26. (Canceled)

27. (Currently Amended) A panel, comprising: ~~device positions with semiconductor devices arranged in rows and columns, as claimed in claim 16~~

a plastic package molding compound;

semiconductor chips;

a leadframe, the semiconductor chips being embedded in the plastic package molding compound, wherein an upper side of the semiconductor chips and the plastic package molding compound are arranged on the leadframe;

each semiconductor chip and a respective portion of the plastic package molding compound and of the leadframe forming a semiconductor device, the semiconductor devices being arranged in rows and columns; and

an elastic adhesive layer being arranged between the plastic package molding compound and the leadframe, and between the semiconductor chips and the leadframe, configured for mechanical decoupling of an upper region from a lower region of the semiconductor devices,

wherein peripheral regions of the semiconductor devices are free of the elastic adhesive layer and comprise a metal layer, the metal layer completely covering the leadframe in the peripheral regions of the semiconductor devices and mechanically decoupling the plastic package molding compound from the leadframe.

28-29. (Canceled)

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30. (Currently Amended) A method for producing a panel with a plastic package molding compound, semiconductor chips and a leadframe in a number of semiconductor device positions, the method comprising:

producing a leadframe with device positions arranged in rows and/or columns;

applying an elastic adhesive layer, covering both the region of the intended semiconductor chip and the region of the intended plastic package molding compound on an upper side of the leadframe in the device positions;

adhesive attachment of semiconductor chips onto the adhesive layer in the device positions;

establishing electrical connections between contact areas of the semiconductor chip and the leadframe in the device positions; ~~and~~

applying a plastic package molding compound to the adhesive layer while embedding the semiconductor chips and while forming a panel with a number of semiconductor device positions; and

dividing up the panel into individual semiconductor devices along sawing tracks;

wherein a pattern of a metal layer is applied to the leadframe before the application of the adhesive layer, the pattern of the metal layer covering more than a width of the sawing tracks so that the adhesive layer is not exposed to the sawing process.

31. (Currently Amended) The method as claimed in claim 30, comprising wherein ~~a the~~ pattern of ~~the metal layers, which covers more than the width of the sawing tracks with the metal layers, and having a~~ layer has a width in the range of 1.2 times to 3 times the width of the sawing tracks, ~~is applied to the leadframe before the application of the adhesive layer.~~

32. (Previously Presented) The method as claimed in claim 30, comprising wherein a central opening for a bonding channel is introduced in the device positions of the leadframe when the leadframe is produced.

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33. (Previously Presented) The method as claimed in claim 30, comprising wherein the semiconductor chip is applied with its active upper side to the adhesive layer of the leadframe while aligning contact areas of the semiconductor chip arranged in two rows over the central opening of the leadframe, and bonding wires for connecting the contact areas of the semiconductor chip to bonding fingers of a wiring structure are attached on the rear side of the leadframe in the device positions.

34-35. (Canceled)

36. (New) The semiconductor device as claimed in claim 16, wherein the metal layer comprises a stack of elastic metal layers.

37. (New) The semiconductor device as claimed in claim 16, wherein:

the leadframe comprises a central opening and bonding fingers of a wiring structure on a rear side of the leadframe, the bonding fingers being arranged at the periphery of the central opening of the leadframe;

wherein the semiconductor chip is applied with its active upper side to the adhesive layer and has contact areas being arranged in two rows over the central opening of the leadframe;

and wherein the contact areas of the semiconductor chip and the bonding fingers of the leadframe are electrically connected to each other by means of bonding wires extending through the central opening of the leadframe.

38. (New) The semiconductor device as claimed in claim 37, wherein the central opening is sealed with the plastic package molding compound.

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39. (New) The panel as claimed in claim 27, wherein the metal layer comprises a stack of elastic metal layers.

40. (New) The method as claimed in claim 30, wherein the pattern of the metal layer comprises a stack of elastic metal layers.